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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/799,049	03/12/2004	David L. Detlefs	SMY-110.01	6736

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EXAMINER
MOFIZ, APU M

ART UNIT	PAPER NUMBER
2165	

DATE MAILED: 09/13/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

PTO-90C (Rev. 10/03)

	Application No.	Applicant(s)
Office Action Summary	10/799,049	DETLEFS ET AL.
	Examiner	Art Unit	
	Apu M. Mofiz	2165	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE <u>3</u> MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on <u>12 March 2004</u>.

2a)☐ This action is **FINAL**.   2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) <u>1-53</u> is/are pending in the application.

    4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) <u>1-9,11-22,24-35 and 37-53</u> is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on <u>12 March 2004</u> is/are: a)☒ accepted or b)☐ objected to by the Examiner.

    Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

    Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

    a)☐ All b)☐ Some * c)☐ None of:

      1.☐ Certified copies of the priority documents have been received.

      2.☐ Certified copies of the priority documents have been received in Application No. _____.

      3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

    * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1)☒ Notice of References Cited (PTO-892)

2)☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3)☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date <u>07/14/2004</u>.

4)☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5)☐ Notice of Informal Patent Application

6)☐ Other: _____.

DETAILED ACTION

Claim Objections

1.   Claims 28 and 41 are objected to because of the following informalities: .

Claim 28 depends from claim 29 and claim 41 depends from claim 42. Examiner

believes claim 28 should depend from claim 28 and claim 41 should depend from claim

40.

Appropriate correction is required.

Claim Rejections - 35 USC § 101

2.   35 U.S.C. 101 reads as follows:

> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of
> matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the
> conditions and requirements of this title.

As to claims 40-52, the claimed invention is directed to non-statutory subject

matter. Electromagnetic signals, radio wave, microwave and lights are not statutory

subject matter.

This rejection can be avoided by changing to "computer readable storage

medium".

Double Patenting

3.   The nonstatutory double patenting rejection is based on a judicially created
doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the
unjustified or improper timewise extension of the "right to exclude" granted by a patent
and to prevent possible harassment by multiple assignees. See *In re Goodman*, 11
F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225
USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA

1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970);and, *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent is shown to be commonly owned with this application. See 37 CFR 1.130(b).

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

4.   Claims 1-9, 11-22, 24-35, 37-48 and 50-53 are provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-133 of copending Application No. 10/800363, claims 1-52 of copending Application No. 10/985,447, claims 1-133 of copending Application No. 10/985,712, claims 1-93 of copending Application No. 10/986,401. Although the conflicting claims are not identical, they are not patentably distinct from each other because the subject matter claimed in the instant application is fully disclosed in the patent and is covered by the patent since the patent and the instant application are claiming common subject matter and they are substantially similar in scope and they use the same limitations, using varying terminology. They are not patentably distinct from each other because 1-133 of copending Application No. 10/800363, claims 1-52 of copending Application No. 10/985,447, claims 1-133 of copending Application No. 10/985,712, claims 1-93 of copending Application No. 10/986,401 contain every element of claims 1-9, 11-22, 24-35, 37-48 and 50-53 of the instant specification.

"A later patent claim is not patentably distinct from an earlier patent claim if the later claim is obvious over, or anticipated by, the earlier claim. In re Longi, 759 F.2d at 896, 225 USPQ at 651."

This is a _provisional_ obviousness-type double patenting rejection because the conflicting claims have not in fact been patented.

Claim Rejections - 35 USC § 102

5.   The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1-9, 11-22, 24-35, 37-48 and 50-53 rejected under 35 U.S.C. 102(b) as being anticipated by Jacob et al., Concurrent Remembered Set Refinement in Generational Garbage Collection, August 01, 2002, pages 1-14 and hereinafter referred to as Jacob.

As to claims 1,14,27,40 and 53, Jacob teaches a computer system configured by stored instructions as a garbage collector that reclaims for reuse memory allocated by a mutator executing on the computer system, wherein the garbage collector: A) repeatedly performs global marking operations (i.e., not managed by programmers locally, but done globally e.g., through registers) on the heap (page 1, column 1); B)

treats the heap as divided into a plurality of heap regions (i.e., regions based on age or generation) (pages 1-5) for each of at least some of which the garbage collector so maintains a respective remembered set associated therewith that, independently of which other heap regions contain references to objects in that heap region (i.e., cross-generational pointers), entries in that remembered set identify the locations of all such references (pages 1-5); C) performs space-incremental-collection operations, associated with respective collection sets, in which the garbage collector employs each remembered set associated with a region in the collection set to determine whether objects in the collection set satisfy a potential-reachability criterion and reclaims memory occupied by objects that do not satisfy the potential-reachability criterion (pages 1-5; page 9); and D) selects regions for the collection sets by performing calculations of collection-efficiency estimates based at least in part on at least one said global marking operation's results (pages 1-5; page 9).

As to claims 2, 15, 28 and 41, Jacob teaches wherein the calculations of the collection-efficiency estimates include, for regions containing only objects allocated at the beginning (i.e., the youngest) of the most-recent completed global marking operation, estimating from that global marking operation's results respective amounts of memory likely to be reclaimed if those regions are included in the collection set (pages 1-5; page 9).

As to claims 3,13,16,26,29,39,42 and 52, Jacob teaches wherein the global marking operations are performed at least in part concurrently with the mutator's execution (pages 1-5; page 9).

As to claims 4,9,12,17,22,25,30,35,38,43,48 and 51, Jacob teaches wherein the calculations of collection-efficiency estimates include determining which of a set of candidate groups of regions yields the greatest ratio (i.e., the ratio between the old and young reclamation cost) of likely memory reclamation to reclamation cost (pages 1-5; page 9).

As to claims 6,19,32 and 45, Jacob teaches wherein the calculations of the collection-efficiency estimates include, for at least some regions, calculating a cost from the sizes of the remembered sets associated therewith (pages 1-5; page 9).

As to claims 7,20,33 and 46, Jacob teaches wherein: A) the collector associates respective age values with the regions (i.e., the young and old regions) (pages 1-5; page 9); B) the calculations of the collection-efficiency estimates include, for some regions, making estimates, based of those regions' age values, of respective amounts of memory likely to be reclaimed if those regions are included in the remembered set (pages 1-5; page 9).

As to claims 8,21,34 and 47, Jacob teaches wherein: A) the collector calculates, for each of a plurality of the age values, a respective average of how much memory has been reclaimed from regions with which it associates that age value (pages 1-5; page 9; page 11); and B) the estimates based on the regions' age values are calculated from those averages (pages 1-5; page 9; page 11).

As to claims 5,11,18,24,31,37,44 and 50, Jacob teaches wherein: A) each of at least some of the global marking operations includes tracing reference chains from a root set (i.e., from the older generation) and so making marks associated with that global marking operation and with the locations of respective objects thereby encountered that in at least some portions of the heap an object's lack of reachability can be inferred at the end of that global marking operation from the absence of a mark associated with that object's location and that global marking operation; and B) each of at least some of the space-incremental-collection operations includes: i) inferring from the marks made by one of the global marking operations that objects in the collection set are unreachable; and ii) reclaiming the memory space occupied by such objects (i.e., garbage collection based on both global marking (e.g., mark and sweep) and space based garbage collection) (pages 1-5; page 9).

Allowable Subject Matter

6.   Claims 10,23 and 36 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is a statement of reasons for the indication of allowable subject matter:

The prior art of Jacob does not disclose, teach or suggest the claimed limitations of (in combination with all other features in the claims), a computer system, which includes A) each space-incremental-collection operation includes processing d remembered-set-log-buffer entries, $d >= 0$, in order to update remembered sets; and B) the reclamation cost $V(c.s)$ for a candidate group cs of regions is determined in accordance with $V(cs) = Vfixed + U . d + ... + c . liveBytes(r))$, where Vfixed represents fixed costs common to all pauses, d is the number of remembered-set-log-buffer entries to be scanned during that space-incremental-collection operation, U is the average cost of scanning a remembered-set-log-buffer entry, S is the cost per remembered-set entry of scanning a remembered set, $rsSize(r)$ is the number of remembered-set entries in the remembered set maintained for region r, C is the cost per byte of evacuating and scanning an object that is not reclaimed, and $liveBytes(r)$ is an estimate of how many bytes will not be reclaimed from region r, as claimed in claims 10,23 and 36.

Points of Contact

7.   Any inquiry concerning this communication or earlier communications from the examiner should be directed to Apu M. Mofiz whose telephone number is (571) 272-4080. The examiner can normally be reached on Monday – Thursday 8:00 A.M. to 4:30 P.M.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jeffrey Gaffin can be reached at (571) 272-4146. The fax numbers for the group is (571) 273-8300.

Any inquiry of a general nature or relating to the status of this application should be directed to the Group receptionist whose telephone number is (703) 305-9600.

Apu M. Mofiz
Primary Patent Examiner
Technology Center 2100

September 12, 2006